

TOILET OUTLET SEAL

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REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of co-pending U.S. Patent Application 10/306,777 filed 26 November 2002.

FIELD OF THE INVENTION

[0002] The present invention relates to a seal for a waste outlet; and particularly, but not exclusively, to a seal for a toilet outlet for connecting a toilet to a soil pipe.

BACKGROUND OF THE INVENTION

[0003] In certain countries, it is conventional for a toilet waste outlet to be formed in the base of a toilet bowl, with the outlet connected to a soil pipe or a soil stack. With this arrangement, waste travels vertically from the toilet into the soil stack, and a particular configuration of seal is required to connect the outlet to the soil stack. One common form of seal which is used is an annular wax seal, which receives the base of the toilet bowl within the soil stack inlet; the wax seal deforms to provide a seal against the toilet bowl. However, this deformation is not easily reversible, such that in the event that the toilet is, for example, misaligned during fitting and part of the seal experiences a high degree of compression, the seal cannot be easily reformed and may have to be replaced. In practice, such damage to the seal is not likely to be apparent to the person fitting the toilet, and the toilet will then be fitted with an imperfect seal. Furthermore, wax is a relatively unstable material, and may melt if the seal is exposed to even relatively low temperatures, for example, above 40°C, and may become brittle at lower temperatures.

[0004] An alternative arrangement makes use of a rubber or other elastomeric seal ring, which sits between the toilet bowl outlet and the soil stack. The seal ring is resiliently deformable, and is thus intended to deform when a toilet bowl is received therein to provide a seal. The seal ring includes an upper lip which abuts the toilet outlet and the upper edge of the soil stack; the lip is pushed against the edge of the soil stack by the weight of the toilet bowl to provide a seal. Such a seal ring is described in International Patent Application WO00/09825. While this arrangement

provides improved features when compared with conventional wax seals, there are however disadvantages with this type of resilient seal. In particular, the seal relies on pressure being applied by the toilet evenly around the circumference of the lip of the seal ring. In the event that the toilet is installed slightly off centre, or at a skewed angle, uneven deformation may result, which may lead to splaying or collapse of the lip and failure to form an effective seal. Thus, careful alignment and fitting of the toilet is necessary for the seal ring to be effective.

[0005] It is among the objects of embodiments of the present invention to obviate or alleviate these and other disadvantages of conventional seal arrangements.

SUMMARY OF THE INVENTION

[0006] According to a first aspect of the present invention, there is provided a seal comprising a generally annular body for location between two members to be connected, the body comprising a deformable lip for abutting one of the members to be connected, the lip being arranged such that the lip rolls radially when subject to axial compression.

[0007] Thus, the seal of the present invention may be located, for example, between a toilet outlet and a soil pipe, and the compression of the lip caused by the weight of the toilet on the seal will cause the lip to roll radially. This arrangement not only allows an effective seal to form between the rolled lip and the toilet bowl, but the rolling action reduces unpredictable slippage between the bowl and lip; the contact between the toilet and the seal lip will be a rolling contact,

and as such will be relatively unaffected by the frictional properties of the surfaces of the toilet or lip. Further, the predictable rolling action of the lip reduces the likelihood of buckling of the lip or other parts of the body, which would affect formation of a seal, and reduces the need for maintaining accurate alignment of the toilet on the seal during installation.

[0008] Preferably the body is generally tubular. The length of the tubular body may be selected depending on that particular application for which the seal is to be used. Certain embodiments of the invention may be tapered, with an upper portion of the body being of greater diameter than a lower portion. Preferably the body is generally frustoconical.

[0009] Preferably the lip is undercut; that is, the lip extends radially beyond a side wall of the body in the immediate vicinity of the lip. The lip may also provide a generally cylindrical surface profile; that is, the profile of the lip forms a section of a cylindrical surface. Conveniently the surface profile of the lip is substantially half of a cylinder, or hemicylindrical. Undercutting the lip in this manner serves to improve radial rolling of the lip. Most preferably, the highest point of the lip, that is the part of the lip which first engages said one of the members to be connected, is positioned radially outwardly of a mid-point of the adjacent body wall, to ensure that the lip rolls radially outwardly relative to the body wall.

[0010] Preferably the lip in use abuts only one of the members to be connected. Conveniently the body further comprises a flange located spaced from the lip, for spacing the lip from the second member to be connected. The flange is preferably substantially rigid, in that

little or no deformation of the flange occurs when the lip and flange are under load. The flange arrangement ensures that the lip is at least initially clear of the second member to be connected, and hence that the lip is free to roll radially under pressure.

[0011] Preferably the body is substantially resilient. Conveniently the body comprises elastomeric or rubber material. This allows the body to conform to the members to be connected. Alternatively, only the lip may be substantially resilient; however, this is not a preferred embodiment.

[0012] Preferably the lip further comprises ridges or other friction-increasing formations thereon. Conveniently the ridges extend substantially circumferentially around the lip. This serves to increase the friction between the toilet and the lip, and maintain the desired rolling movement of the lip and formation and maintenance of a sealing contact.

[0013] Preferably the body further comprises a sealing portion for forming a seal between the body and the second member to be connected. The sealing portion conveniently comprises a ridge or other protrusion on an outer surface of the body wall. This conveniently forms an interference fit between the body and the second member to be connected, and hence will provide a sealing contact. The sealing portion is preferably on a lower portion of the body.

[0014] The seal may further comprise an interior sealing member located in an interior portion of the body; for example, where the body is generally tubular, the sealing member may be located within a bore of the tube. The sealing member is preferably resilient. Preferably the

sealing member comprises a membrane or diaphragm extending radially within the body. In use, the sealing member will contact for example an outlet portion of a toilet or the like; this forms a further seal in addition to the seal formed by the lip on another portion of the toilet. The sealing member is preferably adapted to be deformed when subject to force exerted by a member to be connected; this arrangement allows the sealing member to conform to the shape of the member to be connected when in contact, and so provide a more effective seal than otherwise; and to return towards the original configuration when not in such contact. The original configuration may be selected to provide at least a partial barrier within the body of the seal when not in contact with the member, to reduce the extent of any backflow through the sealing member before the members have been connected to the seal.

[0015] According to a further aspect of the present invention, there is provided a seal member comprising a body having a bore therethrough, the body being for location between two members to be connected, the body comprising a lip for abutting one of the members to be connected, the lip being undercut.

[0016] According to a still further aspect of the present invention, there is provided a seal member comprising a body having a bore therethrough, the body being for location between two members to be connected, the body comprising an interior sealing member for abutting a portion of one of the members to be connected so as to form a seal therewith.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] These and other aspects of the present invention will now be described by way of example only and without limitation, with reference to the accompanying drawings, in which:

[0018] Figure 1 shows a side view of a seal in accordance with an embodiment of the present invention;

[0019] Figure 2 shows a sectional side view on line B - B of Figure 1;

[0020] Figure 3 shows a perspective view of the seal of Figure 1;

[0021] Figure 4 shows a sectional side view of the seal of Figure 1 in combination with a toilet bowl and soil stack inlet;

[0022] Figure 5 shows a sectional side view of an alternative seal in accordance with an embodiment of the present invention;

[0023] Figure 6 shows a side view of the seal of Figure 5; and

[0024] Figure 7 shows a top view of the seal of Figure 5.

DETAILED DESCRIPTION OF THE DRAWINGS

[0025] Referring first of all to Figures 1 to 3, these show a seal 10 in accordance with an embodiment of the present invention. The seal 10 is formed of a moulded hollow rubber body 12 having a generally frustoconical form. The body 12 has a lower seal 14 formed of a thickened ring of rubber extending around the circumference of the body 12.

[0026] On the upper portion of the body 12 is an undercut lip 16 extending circumferentially around the body 12. The lip is generally semicircular in cross-section, as can be seen best in Figure 2, and carries a number of circumferential ribs 18. Located on the body below and spaced from the lip 16 is a circumferential shoulder or flange 20, which is generally solid.

[0027] In use, the seal 10 may be disposed, as illustrated in Figure 4, between a toilet bowl 22 and a soil pipe 24. The soil pipe 24 may be set into an opening in a floor (not shown), and leads into a soil stack which connects to a mains sewerage system. In installing the seal 10, the seal 10 is first placed into the pipe 24. The resilient nature of the rubber body 12 allows the seal 10 to be easily placed into the pipe 24 by deformation of the body 12. The body 12 is lowered into the soil pipe 24 until the flange 20 rests on the upper edge of the soil pipe, formed as a pipe flange 26.

[0028] The lower seal 14 of the body 12 is sized to fit securely in an interference fit into the soil pipe 24, and so create a seal with the pipe 24, preventing gases, fluids, and the like from escaping past the seal 10.

[0029] Once the seal 10 is located within the soil pipe 24, the toilet 22 may be placed in position. The toilet 22 is lowered onto the lip 16 of the seal 10. As the toilet 22 is lowered, the ribs 18 serve to increase the friction between the toilet 22 and the lip 16, while the undercut formation of the lip 16 causes the lip 16 to roll radially outwardly from the centre of the body 12 as load is exerted vertically thereon by the weight of the toilet 22.

[0030] The flange 20 is relatively heavy and incompressible, and supports the weight of the toilet and the seal 10 itself, such that the walls of the body 12 do not buckle. Further, the rolling action of the lip 16 provides for predictable and recoverable deformation of the lip as the toilet 22 is lowered onto the lip, such that precise alignment of the toilet is not necessary to prevent buckling of the seal; this effect is improved by the spacing of the lip 16 and the flange 20 such that the lip 16 contacts only the toilet 22, and not the soil pipe 24, and so is free to roll outwardly without external constraint. In certain embodiments of the invention, under sufficient load, the lip 16 may roll sufficiently to form a tube contacting the flange 20.

[0031] Once the full weight of the toilet is supported by the seal 10, an effective seal is created between the lip and the toilet, so preventing escape of noxious gases or fluids.

[0032] Referring now to Figures 5 to 7, these show an alternative embodiment of a seal in accordance with the present invention. The seal 110 has a significantly lesser axial dimension than the seal 10 of Figures 1 to 4. The seal 110 includes a lip 116 with ridges 118, as well as a lower seal 114, each of which is constructed in and functions in a similar manner to the corresponding parts of the seal 10 of Figures 1 to 4. The present seal 110 lacks an equivalent part to the flange 20, although the shoulder 120 will generally seat on the upper edge of a soil pipe in a similar manner when installed.

[0033] The other major difference of the alternative seal 110 over the seal 10 of Figures 1 to 4 is the inclusion of a radially extending resilient diaphragm member 128 located in the internal

bore of the seal 110. The diaphragm member 128 defines a central opening 130 which is formed in a generally hexagonal shape, and which allows fluid and the like to be passed through the seal 110. The diaphragm member 128 includes a small annular ridge 129 on the underside thereof. When the seal 110 is disposed between a toilet bowl and a soil pipe, as illustrated in Figure 4 with reference to the seal 10, the lowermost portion of the toilet bowl 22, which is formed in a conical shape, will engage with and deform the diaphragm member 128. This causes a seal to be formed between the toilet bowl 22 and the diaphragm member 128, thereby providing an additional seal to those formed by the lip 116 and the lower seal 114. Removal of the toilet bowl 22 allows the resilient diaphragm 128 to partially close and return to the configuration shown in Figure 5; this helps to restrict backflow of fumes and the like from a waste outlet when the toilet is not fitted.

[0034] Thus, the present invention allows creation of an effective seal between a toilet and a soil pipe with a reduced risk of buckling or otherwise undesirable distortion of the seal, and hence a lesser need for careful alignment of the toilet during fitting. Further, although the invention has been primarily described with reference to sealing between a toilet and a soil pipe, it will be understood that the seal of the invention may be applied to any suitable members to be sealed.

[0035] In addition, given the frustoconical shape of the body 12, and its production from resilient rubber material, judicious selection of diameters of the upper and lower portions of the

body 12 may allow the body to be collapsed into itself for storage and transport.

[0036] It will be understood that the foregoing is for illustrative purposes only, and that various modifications may be made to the seal described herein without departing from the scope of the invention. For example, reference is made herein to outward rolling of the seal lip; in other embodiments, it may be more convenient for the lip to roll radially inwardly, for example when the lip is intended for location within a member. In addition, the diaphragm member 128 described above in combination with a lip 116 arrangement may be incorporated into alternative seals which do not make use of the lip 116. For this reason, reference should be made to the appended claims for determination of the scope of the invention.